

60LT01103
(GP3-0009)

REMARKS

Allowed Claims

Applicants gratefully acknowledge the allowance of claims 12, 13, 18, 19, and 22. 11/24/04 Office Action, page 6, paragraph no. 5.

Claim Rejections Under 35 U.S.C. § 103(a)

Claims 1-11, 14-17, 20, 21, 23-28, 33-35, 38, and 39 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 6,518,362 to Clough et al. ("Clough") in view of U.S. Patent No. 5,017,663 to Mizuno et al. ("Mizuno").

Applicants respectfully traverse this rejection.

Clough generally describes a curable melt blended composition and a method of making the composition by melt blending a thermoplastic polymer comprising polyphenylene ether (PPE) polymer and a polystyrene polymer, and optionally a compatibilizer, with an uncured epoxy component, comprising a curable epoxy and an epoxy curing agent, at a temperature greater than 150°C and without addition of solvent. Clough abstract. Clough's compositions are curable compositions that are processed first by blending the components, then shaping the composition into the desired article, then exposing the article to irradiation or heat, thereby curing the epoxy component. Clough, col. 10, ll. 44-61.

Mizuno broadly relates to compatibilized polyamide-polyphenylene ether compositions. Mizuno, col. 1, ll. 5-7. Mizuno generally describes a thermoplastic resin composition comprising (1) 100 parts by weight of a composition comprising 5-95 weight percent polyphenylene ether resin and 95-5 weight percent polyamide, and (2) 0.01 to 10 parts by weight of a particular dinitrodiamine compound. Mizuno abstract. The composition preferably further contains a rubber-like polymer. *Id.* Many possible rubber-like polymers are listed, and their description spans over 100 lines. Mizuno, col. 11, l. 60 to col. 13, l. 47 and cols. 23-27, Table 3. Among these many possibilities, the rubber-like polymer may be a maleic anhydride modified hydrogenated styrene-butadiene-styrene block copolymer. Mizuno, cols. 23-27, Table 3, first footnote. The

60LT01103
(GP3-0009)

composition may optionally contain a polyamide-polyphenylene ether compatibilizer. Mizuno, col. 13, ll. 53-56. Broad compatibilizer classes include polyfunctional compounds (E), epoxy compounds (J), and organosilane compounds (K). Mizuno, col. 13, ll. 56-58, and col. 16, line 52 to col. 17, line 15. Mizuno's compositions, like other thermoplastic blends of polyphenylene ether and polyamide, are typically prepared by melt mixing. Mizuno, col. 20, ll. 61-66. After melt mixing, Mizuno's composition may be formed into article by conventional thermoplastic processing techniques such as injection molding, or extrusion molding. Mizuno, col. 21, ll. 5-12. As expected for a thermoplastic composition, Mizuno does not teach or suggest a separate curing step because such a step is not necessary.

Applicants' invention relates broadly to curable thermosetting compositions. See, e.g., present application, paragraph 4. Applicants encountered difficulty in preparing curable compositions containing substantial amounts of poly(arylene ether) because the high temperatures required to intimately mix the poly(arylene ether) and the thermosetting resin and to maintain such an intimate mixture were incompatible with desired low-temperature cure agents. Present application, paragraphs 1 and 4. After extensive experimentation, Applicants discovered certain compatibilizing agents that allowed the polyphenylene ether to be maintained in an intimately mixed state in the curable composition even after cooling to temperatures sufficiently low to allow the incorporation of low-temperature cure agents without substantial curing. See, e.g., present invention, paragraph 11. Applicants' claim 1 is reproduced below.

1. (original) A curable composition, comprising:
about 5 to about 50 parts by weight of a poly(arylene ether);
about 25 to 90 parts by weight of a thermosetting resin selected from the group consisting of epoxy resins, polyester resins, polyimide resins, bis-maleimide resins, cyanate ester resins, vinyl resins, benzoxazine resins, benzocyclobutene resins, and mixtures comprising at least one of the foregoing thermosetting resins;
about 0.5 to about 15 parts by weight of a compatibilizing agent selected from the group consisting of polyvinyl acetal resins, styrene-butadiene-styrene block copolymers, styrene ethylene styrene block copolymers, styrene-ethylene-butylene-styrene block copolymers, functionalized butadiene-acrylonitrile copolymers, styrene-butadiene core

60LT01103
(GP3-0009)

shell rubbers, styrene-butadiene-styrene core shell rubbers, and mixtures comprising at least one of the foregoing compatibilizing agents; and

about 3 to about 150 parts by weight per 100 parts of weight of the thermosetting resin of an amine cure agent selected from the group consisting of amidoamines, polyamides, cycloaliphatic amines, modified cycloaliphatic amines, aromatic amines, modified aromatic amines, BF₃-amine adducts, imidazoles, guanidines, arylene polyamines, and mixtures comprising at least one of the foregoing amine cure agents;

wherein the parts by weight of the poly(arylene ether), the thermosetting resin, and the compatibilizing agent sum to 100.

Applicants' compositions provide substantial improvements in fracture toughness while maintaining desirable curing conditions. See, e.g., present application, Table within paragraph 66.

Notwithstanding the Examiner's statements to the contrary, there is no motivation to combine Clough and Mizuno. "When a rejection depends on a combination of prior art references, there must be some teaching, suggestion, or motivation to combine the references." *Ecolochem, Inc. v. Southern California Edison Co.*, 56 U.S.P.Q.2d 1065, 1073 (Fed. Cir. 2000). For one of ordinary skill in the art to be motivated to combine references, the references must be from analogous art areas. *In re Clay*, 966 F.2d 656, 658-659 (Fed. Cir. 1992). A secondary reference is analogous art with respect to a primary reference if the secondary reference is (1) from the same field of endeavor, regardless of the problem addressed, or (2) not from the same field of endeavor, but reasonably pertinent to the particular problem with which the inventor is involved. *Id.* "Combining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability – the essence of hindsight." *In re Dembicza*k, 50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999). The Examiner has stated that "Mizuno and Clough are analogous art in that they both come from the same field of endeavor, namely thermoplastic polyphenylene ether compositions that contain block copolymers and epoxy resins." 11/24/04 Office Action, page 3, second full paragraph. Applicants respectfully disagree. Mizuno and Clough are not analogous art because they are not from the same field of endeavor, and Clough is not reasonably pertinent to the particular problem with which Applicants are involved.

60LT01103
(GP3-0009)

Mizuno and Clough are not from the same field of endeavor. Clough relates to curable compositions. Clough abstract. Clough's invention was directed to providing curable compositions in which polyphenylene ether, polystyrene, epoxy resin, and cpoxy curing agent could be combined at a temperature greater than 150°C without using solvent and without curing the epoxy resin. Clough, col. 2, ll. 46-52. The Clough compositions are utilized by blending the components (without curing the epoxy resin), shaping the composition into the desired article, and exposing the article to irradiation or heat, thereby curing the epoxy component. Clough, col. 10, ll. 44-61. In the absence of a separate curing step, no epoxy curing takes place. Clough, col. 11, ll. 18-20. Thus, Clough's compositions are typical of thermoset compositions in that they require a separate curing step in order to activate the thermoset resin and cure the composition. Applicants' compositions are also curable thermoset compositions that require a separate curing step. See, e.g., present application, paragraph 63 (curing for two hours at 100°C plus four hours at 175°C). In contrast to the curable compositions described in Clough and the present application, the compositions described in Mizuno are thermoplastic polyamide-polyphenylene ether compositions that do not utilize a curing step. Mizuno's compositions, like other thermoplastic blends of polyphenylene ether and polyamide, are typically prepared by melt mixing. Mizuno, col. 20, ll. 61-66. After melt mixing, Mizuno's composition may be formed into article by conventional thermoplastic processing techniques such as injection molding, or extrusion molding. Mizuno, col. 21, ll. 5-12. As expected for a thermoplastic composition, Mizuno does not teach or suggest a separate curing step because such a step is not necessary. To the extent that Mizuno's compositions may utilize an epoxy compound as one of many possible compatibilizers taught, the epoxy compatibilizer functions by reacting during melt mixing. In other words, Mizuno requires the epoxy compound to react during mixing of the compositions, whereas Clough and the present invention are expressly directed to preventing reaction of the epoxy compound during the mixing step. Mizuno, being directed to thermoplastic compositions in which the compatibilizer functions during melt mixing, and Clough, being directed to curable compositions in which the epoxy compound is substantially unreacted during mixing and reacted only in a subsequent curing step, are not from the same field of endeavor.

60LT01103
(GP3-0009)

Furthermore, Mizuno is not reasonably pertinent to the particular problem with which Applicants are involved. Mizuno is directed to providing thermoplastic polyamide-polyphenylene ether compositions with improved compatibility while maintaining good solvent resistance, heat resistance, and impact strength. Mizuno, col. 2, ll. 6-11. In contrast, Applicants' invention is directed to incorporating increased amounts of poly(arylene ether) into a curable thermoset composition while still allowing the use of low temperature cure agents. Present application, paragraphs 1 and 4. Mizuno is therefore not reasonably pertinent to the particular problem with which Applicants are involved.

Since Mizuno and Clough are not from the same field of endeavor, and since Mizuno is not reasonably pertinent to the particular problem with which Applicants are involved, Clough and Mizuno are not analogous art and there would be no motivation for one of ordinary skill in the art to combine them. Only by using impermissible hindsight and Applicants' claims as a blueprint would one combine Clough and Mizuno in order to select epoxy compounds from among Mizuno's many possible polyamide-polyphenylene ether compatibilizers and select maleic anhydride modified hydrogenated styrene-butadiene-styrene block copolymer from among Mizuno's many possible rubber-like polymers in order to modify the nonanalogous curable composition of Clough. Accordingly, the proposed combination of Clough and Mizuno does not support a *prima facie case of obviousness* over Applicants' claims. Applicants therefore respectfully request the reconsideration and withdrawal of the rejection of claims 1-11, 14-17, 20, 21, 23-28, 33-35, 38, and 39 as obvious over Clough in view of Mizuno.

60LT01103
(GP3-0009)

It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance is requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 07-0862 maintained by Assignee.

Respectfully submitted,

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